Section 5 — Corrosion Protection

To prevent leaks, all parts of your UST system that are underground and routinely contain product need to be protected from corrosion. The UST system includes the tank, piping, and ancillary equipment, such as flexible connectors, fittings, and pumps. Unprotected metal UST components can deteriorate and leak when underground electrical currents act upon them.

One way to protect UST components from corrosion is to **make them with nonmetallic, noncorrodible materials**, such as USTs made of (or clad or jacketed with) fiberglass reinforced plastic (FRP) or other noncorrodible materials — as illustrated by the FRP tank on the right. Noncorrodible USTs like these do not require O&M for corrosion protection.

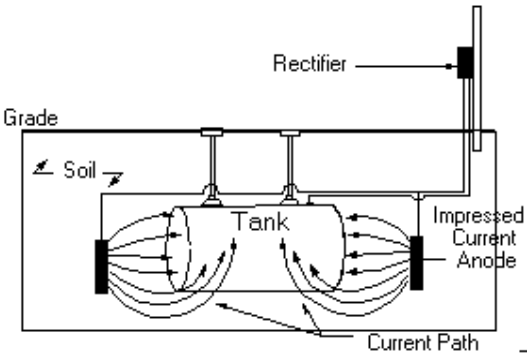
UST components made from metal, however, that routinely contain product and are in direct contact with the ground need corrosion protection provided by cathodic protection or (in some cases) lining the interior of the tank, as described below. These options require O&M.

NOTE: Metal tanks or piping installed after December 22, 1988 must have a dielectric coating (a coating that does not conduct electricity) in addition to the cathodic protection described below.

Cathodic Protection Using Sacrificial Anode Systems

Sacrificial anodes are buried and attached to UST components for corrosion protection — as illustrated on the right by an anode attached to a tank. Anodes are pieces of metal that are more electrically active than steel, and thus they suffer the destructive effects of corrosion rather than the steel they are attached to.

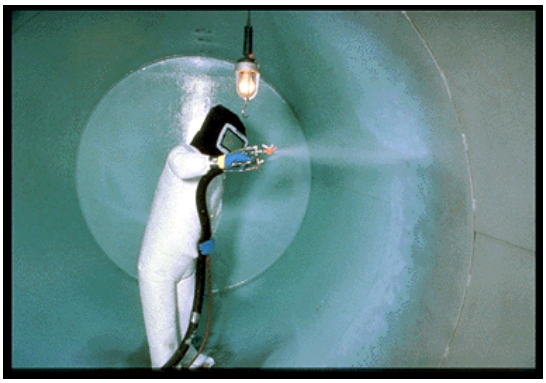
Cathodic Protection Using Impressed Current Systems



An impressed current system — as shown on the right — uses a rectifier to provide direct current through anodes to the tank or piping to achieve corrosion protection. The steel is protected because the current going to the steel overcomes the corrosion-causing current flowing away from it. **The cathodic protection rectifier must always be on and operating to protect your UST system from corrosion.**

Corrosion Protection Using Internal Lining Of The Tank

This corrosion protection option applies only to tanks installed before December 22, 1988. These older tanks can be internally lined by trained professionals to meet the corrosion protection requirements — as shown on the right, in which a professional follows industry codes to safely and effectively line a tank's interior.



It may help you to see your corrosion protection options displayed in the following table.

Corrosion Protection Choices	
Option	**Description**
Noncorrodible Material	The tank or piping is constructed of noncorrodible material.
Steel Tank Clad or Jacketed with a Noncorrodible Material	Examples of cladding or jacket material include fiberglass and urethane. Does not apply to piping.
Coated and Cathodically Protected Steel Tanks or Piping	Steel tank and piping is well-coated with a dielectric material and cathodically protected.
Cathodically Protected Noncoated Steel Tanks or Piping	This option is only for steel tanks and piping installed before December 22, 1988. Cathodic protection is usually provided by an impressed current system.
Internal Lining of Tanks	This option is only for steel tanks installed before December 22, 1988. A lining is applied to the inside of the tank. Does not apply to piping.
Combination of Cathodically Protected Steel and Internal Lining of Tanks	This option is only for steel tanks installed before December 22, 1988. Cathodic protection is usually provided by an impressed current system. Does not apply to piping.
Other Methods Used to Achieve Corrosion Protection	If you have tanks or piping that do not meet any of the descriptions above, check with your state UST agency to see if your UST system meets the requirements for corrosion protection. You also will need to ask about the operation, maintenance, and recordkeeping requirements applicable to this type of UST system.

NOTE: In addition to tanks and piping, all other metal components in direct contact with the ground that routinely hold product — such as flexible connectors, swing joints, fittings, and pumps — must also be cathodically protected.

Use the O&M Checklist on the next page. Following the Checklist look for recordkeeping forms and discussions of special corrosion protection situations.

✔ Basic O&M Checklist For Corrosion Protection

Sacrificial Anode Cathodic Protection Systems	**You need to have a periodic test conducted by a qualified corrosion tester to make sure your cathodic protection system is adequately protecting your UST system. This test needs to be conducted:** ❑ Within 6 months of installation. ❑ At least every 3 years after the previous test. ❑ Within 6 months after any repairs to your UST system. • Make sure that the professional tester is qualified to perform the test and follows a standard code of practice to determine that test criteria are adequate. • If any test indicates that your tanks are not adequately protected, you need to have a corrosion expert examine and fix your system. • Testing more frequently can catch problems before they become big problems. ❑ **You need to keep the results of at least the last two tests on file.** See the next page for a cathodic protection test recordkeeping form.
Impressed Current Cathodic Protection Systems	**You need to have a periodic test conducted by a qualified corrosion tester to make sure your cathodic protection system is adequately protecting your UST system. This test needs to be conducted:** ❑ Within 6 months of installation. ❑ At least every 3 years after the previous test. ❑ Within 6 months after any repairs to your UST system. • Make sure that the professional tester is qualified to perform the test and follows a standard code of practice to determine that test criteria are adequate. • If any test indicates that your tanks are not adequately protected, you need to have a corrosion expert examine and fix your system. • Testing more frequently can catch problems before they become big problems. ❑ **You need to keep the results of at least the last two tests on file.** See next page for a cathodic protection test recordkeeping form. ❑ **You need to inspect your rectifier at least every 60 days to make sure that it is operating within normal limits.** • This inspection involves reading and recording the voltage and amperage readouts on the rectifier. You or your employees can perform this periodic inspection. • Make sure that your cathodic protection professional provides you with the rectifier's acceptable operating levels so that you can compare the readings you take with an acceptable operating level. If your readings are not within acceptable levels, you must contact a cathodic protection professional to address the problem. ❑ **You need to keep records of at least the last 3 rectifier readings.** See page 39 for a "60-Day Inspection Results" recordkeeping form. ❑ **You should have a trained professional periodically service your impressed current system.** ❑ **Never turn off your rectifier!**
Internally Lined Tanks	❑ Within 10 years after lining and at least every 5 years thereafter, the lined tank must be inspected by a trained professional and found to be structurally sound with the lining still performing according to original design specifications. Make sure the professional performing the inspection follows a standard code of practice. ❑ **Keep records of the inspection (as specified in industry standards for lining inspections).**

Record for Periodic Testing of Cathodic Protection Systems

(for use by a qualified cathodic protection tester)

TEST DATE:____/____/____ FACILITY NAME/ID:_____

NOTE: Provide site sketch as directed on the back of this page.

Cathodic Protection (CP) Tester Information:

Name: _____ Phone Number: _____

Address: _____

Testing must be conducted by a qualified CP tester. Indicate your qualifications as a CP tester:

Identify which of the following testing situations applies:

- ❑ Test required within 6 months of installation of CP system (installation date was ___/___/___)
- ❑ Test required at least every 3 years after installation test noted above
- ❑ Test required within 6 months of any repair activity – note repair activity and date below:

Indicate which industry standard you used to determine that the Cathodic Protection test criteria are adequate: _____

Cathodic Protection Test Method Used (check one)	
	100 mV Cathodic Polarization Test
	-850 mV Test (Circle 1 or 2 below) 1) Polarized Potential ("instant off") 2) Potential with CP Applied, IR Drop Considered **Note: All readings taken must meet the -850 mV criteria to pass**
	Other Accepted Method (please describe):

Is the Cathodic Protection System working properly? Yes No (circle one)

If answer is "No" go to the directions at the bottom on the back of this page.

My signature below affirms that I have sufficient education and experience to be a cathodic protection tester; I am competent to perform the tests indicated above; and that the results on this form are a complete and truthful record of all testing at this location on the date shown.

CP Tester Signature**:** _____ Date:_____

KEEP THIS PAPER ON FILE FOR AT LEAST SIX YEARS

Site Sketch: Provide a rough sketch of the tanks and piping, the location of each CP test, and each voltage value obtained (use space below or attach separate drawing). Voltage readings through concrete or asphalt do not provide accurate readings and are not acceptable. Perform sufficient testing to evaluate the entire UST system.

If CP System fails test, you must have a corrosion expert fix the system.

If the answer was "NO" indicating that your CP system is not working, you must have a ***corrosion expert*** investigate and fix the problem. A corrosion expert has additional training, skills, and certification beyond the corrosion tester who filled out the bulk of this form. A corrosion expert must be 1) accredited/certified by NACE International (The Corrosion Society) as a corrosion specialist or cathodic protection specialist, or 2) be a registered professional engineer with certification or licensing in corrosion control. As long as you have the UST, be sure you keep a record that clearly documents what the corrosion expert did to fix your CP system.

KEEP THIS PAPER ON FILE FOR AT LEAST SIX YEARS

60-Day Inspection Results for Impressed Current Cathodic Protection Systems

FACILITY NAME:_____

AMP RANGE RECOMMENDED:_____

VOLTAGE RANGE RECOMMENDED:_____

Date	Your Name	Voltage Reading	Amp Reading	Is Your System Running Properly? (Yes/No)

- **If the rectifier voltage and/or amperage output(s) are outside the recommended operating levels, contact a cathodic protection expert to address the problem.**
- **Never turn off your rectifier.**
- **KEEP THIS RECORD FOR AT LEAST 6 MONTHS AFTER THE DATE OF THE LAST READING**

Some Special Corrosion Protection Situations

What if you have an STI-P3 tank with a PP4 test station?

If you have a PP4 test station installed with an STI-P3 tank, you may perform the periodic testing of your cathodic protection system by using the meter provided to you with the PP4 test station.

- Don't forget to record the result of the reading and keep at least the last two results.
- If your test readings do not pass, you must take action to correct the problem. Call your installer and ask that the corrosion expert who designed the system examine it and correct the problem.

What if you combine internal lining and cathodic protection?

If you chose the combination of internal lining and cathodic protection for meeting corrosion protection requirements on your UST, you may not have to meet the periodic inspection requirement for the lined tank. However, you must always meet the requirements for checking and testing your cathodic protection system as described in the Basic O&M Checklist For Corrosion Protection on the page 36. The 10-year and subsequent 5-year inspections of the lined tank are not required if the integrity of the tank was ensured when cathodic protection was added. You should be able to show an inspector documentation of the passed integrity assessment.

Example 1:
If you have cathodic protection and internal lining applied to your tank at the same time, periodic inspections of the lined tank **are not** required because an integrity assessment of the tank is required prior to adding the cathodic protection and internal lining.

Example 2:
If you had cathodic protection added to a tank in 1997 that was internally lined in 1994 and the contractor did not perform an integrity assessment of the tank at the time cathodic protection was added (or you cannot show an inspector documentation of the passed integrity assessment), then periodic inspections of the lined tank **are** required because you cannot prove that the tank was structurally sound and free of corrosion holes when the cathodic protection was added. The lined tank needs to be periodically inspected because the lining may be the only barrier between your gasoline and the surrounding environment.

What if you have a double-walled steel UST with interstitial monitoring and cathodic protection?

If you have a cathodically protected double-walled steel tank and you use interstitial monitoring capable of detecting a breach in both the inner and outer wall or ingress of product and water as your method of leak detection, then you should monitor your cathodic protection system within six months of installation and following any activity that could affect the CP system.

If you are using impressed current cathodic protection, you still need to perform the 60-day checks of your recifier to make sure that it is operating within normal limits.

- Testing the cathodic protection system more frequently may help catch problems quicker.

- If your test readings do not pass, you must take action to correct the problem. Call your installer and ask that the corrosion expert who designed the system examine it and correct the problem.

- Don't forget to keep at least the last two results of your cathodic protection testing.

Do all UST sites need corrosion protection?

A corrosion expert may be able to determine that the soil at an UST site is not conducive to corrosion and will not cause the tank or piping to have a release during its operating life. If so, you must keep a record of that corrosion expert's analysis for the life of the tank or piping to demonstrate why your UST has no corrosion protection.